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SHAFT DRIVE DEVICE

PRIOR ART

The present invention relates to a shaft drive device, and in particular to a shaft drive device for use in a gauge/control instrument or combination instrument for a motor vehicle, having a rotor device with a rotor and a rotor shaft attached to it, and a stator device for driving the rotor with the rotor shaft.

Although in principle it can be used for arbitrary shaft drive devices, the present invention and the problems it seeks to solve will be explained in terms of a shaft drive device for use in a gauge/control instrument or combination instrument of a motor vehicle, for instance as a pointer shaft drive device for the pointer of a gauge instrument.

In a modern gauge/control instrument or combination instrument of a motor vehicle, many functions are now provided. Although a number of digital gauge instruments are used, nevertheless for the sake of expediency, some pointer instruments are also used, which each require a pointer shaft drive device.

It is quite conventional to mount such a shaft drive device, for instance a stepping motor, as an independent component on a PCB device and put it in contact with the PCB device. However, this kind of procedure is complicated and expensive from a production standpoint and requires a large

amount of space for installation.

The problems the present invention seeks to solve accordingly reside in creating an economical, space-saving and easily installed shaft drive device, in particular for use in a gauge/control instrument or combination instrument of a motor vehicle.

ADVANTAGES OF THE INVENTION

The shaft drive device according to the invention having the characteristics of claim 1 has the advantage that it is compact, especially with a low structural height, and can be produced with a smaller number of components. It is easy to put together and simple to contact, for instance by the SMD (surface mounting device) technique. All SMD parts can be assembled automatically, which simplifies manufacture substantially.

The concept on which the present invention is based is that the stator device and the rotor device can be attached to the PCB device in such a way that the PCB device forms part of the frame, surrounding the rotor shaft, of the shaft drive device. In particular, this makes it possible to integrate the axial guidance or bearing of the rotor shaft with the PCB device. Thus the concept according to the invention offers the opportunity of undoing the shaft drive device as an independent component group and partly integrating it into the PCB device instead.

Advantageous refinements and improvements of the shaft drive device defined by claim 1 are found in the dependent claims.

In a preferred refinement, the PCB device has a leadthrough for the rotor shaft. It is thus possible to attach the pointer to the rotor shaft on one side of the PCB device and to provide the rotor and the stator device on the other side.

In a further preferred refinement, in the PCB device an axial bearing bush for cooperation with at least one radial bearing bush provided on the rotor shaft is provided.

In a further preferred refinement, the axial bearing bush is embodied in one piece with the PCB device.

In a further preferred refinement, the axial bearing bush is embodied in an insert that can be received in the PCB device. The stator device can be attached to this insert in advance in a suitable orientation.

In a further preferred refinement, the rotor shaft can be passed through the PCB device from side of the PCB device to a stop, with the rotor remaining on the other side of the PCB device. This simplifies the installation of the rotor shaft, since the stop prevents the rotor shaft from slipping through.

In a further preferred refinement, the stator device can be attached to the PCB device all the way around the leadthrough for the rotor.

In a further preferred refinement, the stator device can be attached to the insert. The insert may be a small precision-manufactured part, to which the stator device can be attached in a precisely calibrated way.

In a further preferred refinement, the attachment device is designed such that it axially supports the rotor shaft on the other side of the PCB device. The force occurring when the pointer is slipped on is thus counteracted.

In a further preferred refinement, the attachment device has a lid, which can be attached to the other side of the PCB device and which has an axial bearing bush for receiving the corresponding end of the rotor shaft. Thus two functions can be united in a single component, namely a bearing function and a protective function.

In a further preferred refinement, the lid can be locked in the PCB device. This is a simple, sturdy way of doing the attaching.

In a further preferred refinement, the stator device can be aligned with the PCB device via an alignment device, preferably centering pins.

In a further preferred refinement, a spacer can be attached between the rotor and the stator device. This spacer assures a correct alignment of the rotor and stator device.

In a further preferred refinement, the stator device can be attached by SMD soldering or adhesive bonding to the wiring of the PCB device.

In a further preferred refinement, the stator device forms a unit, which has a stator coil core region, a stator winding located thereon, and a stator arm region.